4.0 OB/OD AT CAMP GRANT, ILLINOIS

4.1 TCRA at Camp Grant

Camp Grant was expected to have extensive ordnance contamination due to the fact that it was used for training solders during both cold wars and during the period between the wars. The archive search reports and on-site survey tended to support these expectations since numerous ordnance items had been reportedly found and the site survey team reported seeing several 3" trench mortar rounds. However, during the interim removal action from 29 August 1995 to 31 October 1995 only 152 ordnance items were found, 140 of which contained no explosive filler. The inert items were all 3" Stokes trench mortar rounds. Ten 3" stokes mortar rounds which were found had fuses and live boosters, but sand filler. Two 37mm projectiles were found which were fused with a filler of black powder suspected.

4.2 Site Description

Camp Grant had been renamed Atwood Park and was a functioning nature center that had the Kisawaukee River running between the center of the park. This river served as the dividing line between the firing area (south) and the target area (north). The north side of the river was where the majority of the removal action took place and was where the site trailer and offices were located. The Camp Grant disposal area was located in a Limestone quarry on the south side of the Kisawaukee River about 300 feet further south than the firing area. This area was lower than the surrounding natural grade by about 40 feet and measured about 1000 feet long by about 250 feet wide. Near the entrance to the quarry was the explosives magazines located behind a chain link fence. This quarry was also used previously by the groundskeepers of the Atwood Park to burn leaves, underbrush and trimmings from the nearby area. The location of the quarry disposal area was believed to be uncontaminated by explosives and residues except for possible use during quarrying activity that occurred at least 50 years previously. Any activity and residues that may have been used is believed to be attenuated by natural degradation over time. This was confirmed in the background samples taken prior to detonation activity. Pictures of the quarry are shown in Volume III, OB/OD at Camp Grant.

4.3 Background Sampling

Figure 1.2 shows the location of the sample sites. Samples collected were in turn sampled to form one background sample for the area. This step was taken because of the experience with Camp Claiborne where consolidation of samples was apparent after two sets of individual samples were analyzed. Results are given in Table 4.1, 4.2 and 4.3 for semivolatiles, nitroaromatics and nitramines and metals respectively. The single background sample is shown in the first column of these tables.

Background metals show that mercury was below 2.32 µg/kg, a level above the Illinois Metals Background Range for Counties Within The Metropolitan Statistical Areas of 0.02 to 0.99 µg/kg in soil. Calcium levels were high but this is not unusual because of the nature of the quarry. This level is within the range of the Illinois Background range (813-130,000 µg/kg in soil). Barium is also out of the range of D(<.5) -1.72, namely 14 µg/kg of soil.

The higher than Illinois level for Mercury may be the result of mercury containing explosives used in the quarry which left mercury compounds in the area or from burning of miscellaneous items in the quarry as evident from examination of the quarry floor. This would need to be checked with historical data for the quarry which goes beyond that available to this team.

Background sample shows Dibutyl phthalate to be above the method detection limit: 483 $\mu g/kg_{soil}$ vs <330 $\mu g/kg_{soil}$ MDL. This is a contaminant seen commonly when plastics are used when handling samples or are used in the setup for the explosive detonations.

Initially sand bags were filled with an imported fine grained sugar sand and constructed into a bunker. Very little soil existed over the limestone base for sampling, however some amount of sand did exist in the area and was collected for background samples. Note that some soil had charcoal and burnt residues from pervious groundskeeper activities.

A total of 9 samples were collected and one was analyzed to establish background conditions. Eight samples were taken from the quarry floor and one sample was taken from the imported sugar sand used for filling sandbags.

4.4 Post Shot Sampling

Only one stokes mortar was found for detonation in the sand filled bunker built for the destruction of UXO's expected to be found. The explosion involved 1/2 pounds of KINEPAC and resulted in expulsion of explosive gas out the top of the sand filled bunker but little to no ejecta or dust cloud. As a result, none of the pans set up to collect fallout had any material to sample. Some samples were taken of the sand on the top row of sand bags and of a gray material immediately surrounding the recovered stokes mortar which is believe to be combustion products from the KINEPAC (probably N_2OH and $N_{a_2}CO3$). These samples were frozen for possible future analysis at the laboratory in Huntsville. All measurements for semivolatiles and nitroaromatics/nitramines were below the Method Detection Limits.

4.5 Post Disposal Activity

A series of disposal cells (12 total) were constructed and used for successive detonations (Figure 1.2). These smaller cells were used to control disposal activity however they were considerably smaller than the sandbag bunker initially constructed. The reason that UXB used this smaller disposal containment was that there was considerably less work involved in set up of a detonation and the cells were still able to control the blasts. It was apparent that quite a bit more dust was generated and resulted in more fallout since the imported sand material was strewn around the immediate area inside the quarry and left a fine coating of dust and ejecta materials near the cells.

The post disposal sampling occurred 3-4 days after the last disposal event and after a snow storm had blanked the area with about 1 to 2 inches of snow. This allowed some amount of water to be collected in the form of ice located in small ponding areas, near the disposal pit area.

A total of 3 samples were taken form individual samples collected around the quarry area and later consolidated into 3 soil samples. These consisted of 12 samples one each from each disposal cell and

consolidated into one sample for testing. One perimeter sample taken from a line 3-7 meters north of the disposal cells. One perimeter sample was taken in a second line at 10 meters north of the disposal pits. Results of the laboratory measurements are shown in Tables 4.1, 4.2 and 4.3. All semivolatiles and nitroaromatics/nitramines were below Method Detection Limits. Metals from the water sample are very low. As before, metals from the mercury levels are below an average of 2.34 $\mu g/kg_{soil}$ — a level above the Illinois Background Range.

TABLE 4.1 SEMIVOLATILE CONCENTRATION FOR CAMP GRANT

Compounds (1)	0920 (4) µg/kg		0930 (5) µg/L	1012 (5) µg/kg	1015 (5) µg/kg	1017 (5) µg/kg					
Bis(2-chloroethyl)ether	<330		<100	<330	<330	<330					
1,3-Dichlorobenzene	<330		<100	<330	<330	<330					
1,2-Dichlorobenzene	<330		<100	<330	<330	<330					
1,4-Dichlorobenzene	<330		<100	<330	<330	<330					
Bis(2-chloroisopropyl)ether	<330		<100	<330	<330	<330					
N-Nitrosodi-n-propylamine	<330		<100	<330	<330	<330					
Hexachloroethane	<330		<100	<330	<330	<330					
Nitrobenzene	<330		<100	<330	<330	<330					
Isophorone	<330		<100	<330	<330	<330					
Bis(2-chloroethoxy)methane	<330		<100	<330	<330	<330					
1,2,4-Trichlorobenzene	<330		<100	<330	<330	<330					
Naphthalene	<330		<100	<330	<330	<330					
Hexachlorobutadiene	<330		<100	<330	<330	<330					
2-Chloronaphthalene	<330		<100	<330	<330	<330					
Dimethyl phthalate	<330		<100	<330	<330	<330					
2,6-Dinitrotoluene	<330		<100	<330	<330	<330					
Acenaphthylene	<330		<100	<330	<330	<330					
2,4-Dinitrotoluene	<330		<100	<330	<330	<330					
Diethyl phthalate	<330		<100	<330	<330	<330					
Benzidine	<660		<200	<660	<660	<660					
4-Bromophenyl phenyl ether	<330		<100	<330	<330	<330					
N-nitrosodimethylamine	<330		<100	<330	<330	<330					
Hexachlorocyclopentadiene	<330		<100	<330	<330	<330					
4,Chlorophenyl phenylether	<330		<100	<330	<330	<330					
Fluorene	<330		<100	<330	<330	<330					
Azobenzene	<330		<100	<330	<330	<330					
Hexachlorobenzene	<330		<100	<330	<330	<330					
Phenanthrene	<330		<100	<330	<330	<330					
Anthracene	<330		<100	<330	<330	<330					
Dibutyl phthalate	**483**		<100	<330	<330	<330					
Fluoranthene	<330		<100	<330	<330	<330					
Pyrene	<330		<100	<330	<330	<330					
Butylbenzyl phthalate	<330		<100	<330	<330	<330					
3,3'-Dichlorobenzidine	<330		<100	<330	<330	<330					

(1) < N means N is method detection limit and concentration is <N.
(2) Presence indicated, but less than detection limit.
(3) Tentatively identified and quantitatively estimated.
(4) Background
(5) Post Disposal

TABLE 4.1 SEMIVOLATILE CONCENTRATION FOR CAMP GRANT
(Continued)

Compounds (1)	0920 (4) µg/kg		0930 (5) µg/L	1012 (5) µg/kg	1015 (5) µg/kg	1017 (5) µg/kg					
Benzo(a)anthracene	<330		<100	<330	<330	<330					
Chrysene	<330		<100	<330	<330	<330					
Bis(2-ethylhexyl)phthalate	<330		<100	<330	<330	<330					
Di-n-octyl phthalate	<330		<100	<330	<330	<330					
Benzo(b)fluoranthene	<330		<100	<330	<330	<330					
Benzo(k)fluoranthene	<330		<100	<330	<330	<330					
Benzo(a)pyrene	<330		<100	<330	<330	<330					
Indeno(1,2,3-cd)pyrene	<330		<100	<330	<330	<330					
Dibenzo(a,h)anthracene	<330		<100	<330	<330	<330					
Benzo(g,h,i)perylene	<330		<100	<330	<330	<330					
N-Nitrosodiphenylamine	<330		<100	<330	<330	<330					
Phenol	<330		<100	<330	<330	<330					
2-Chlorophenol	<330		<100	<330	<330	<330					
2-Nitrophenol	<330		<100	<330	<330	<330					
2,4-Dimethylphenol	<330		<100	<330	<330	<330					
2,4-Dichlorophenol	<330		<100	<330	<330	<330					
4-Chloro-3-Methylphenol	<330		<100	<330	<330	<330					
2,4,6-Trichlorophenol	<330		<100	<330	<330	<330					
2,4-Dinitrophenol	<1650		<500	<1650	<1650	<1650					
4-Nitrophenol	<1650		<500	<1650	<1650	<1650					
2-Methyl-4,6-Dinitrophenol	<1650		<500	<1650	<1650	<1650					
Pentachlorophenol	<1650		<500	<1650	<1650	<1650					
1-Methylnaphthalene	<10		<100	<330	<330	<330					
Acetophenone	<10		<100	<330	<330	<330					
Diphenylamine	<10		<100	<330	<330	<330					
2-Aminonaphthalene	<10		<100	<330	<330	<330					
1-Nitropyrene	<10		<100	<330	<330	<330					
2,5-Diphenyloxazole	<10		<100	<330	<330	<330					
2-Nitronaphthalene	<10		<100	<330	<330	<330					
2-Methylnaphthalene (3)	<330		<100	<330	<330	<330					
2-&/or 3-Methylphenol	<330		<100	<330	<330	<330					
4-Methylphenol	<330		<100	<330	<330	<330					
2,4,5-Trichlorophenol	<330		<100	<330	<330	<330					

(1) < N means N is method detection limit and concentration is <N.
(2) Presence indicated, but less than detection limit.
(3) Tentatively identified and quantitatively estimated.
(4) Background
(5) Post Disposal

TABLE 4.2 NITROAROMATICS AND NITROAMINES FOR CAMP GRANT

	0920 (1)		0930 (2)	1012 (2)	1015 (2)	1017 (2)		
Compound	µg/kg		µg/L	µg/kg	µg/kg	µg/kg		
HMX	<17.4		<0.653	<26.1	<22.7	<26.1		
RDX	<27.1		<1.02	<40.6	<35.3	<40.6		
1,3,5 TNB	<30.5		<1.15	<45.8	<39.8	<45.8		
2,4,6 TNT	<20.1		<0.753	<30.1	<26.2	<30.1		
2,4 DNT	<74.0		<2.78	<111	<96.5	<111		
2,6 DNT	<54.2		<2.03	<81.3	<70.7	<81.3		

Key: RDX - Hexahydro-1,3,5-Trinitro-1,3,5-Triazine
HMX - Octahydro-1,3,5,7-Tetranitro-1,3,5,7-Tetrazocine
TNB - Trinitrobenzene
TNT - Trinitrotoluene
DNT - Dinitrotoluene

(1) Background
(2) Post Disposal

TABLE 4.3 METALS CONCENTRATIONS AT CAMP GRANT

			POST DISPOSAL							(6)
	BACKGROUND (1)		WATER (2)	SOIL (3)	SOIL (4)	SOIL (5)	SOIL	SOIL	SOIL	
	0920		0930	1012	1015	1017	MAX.	AVG	AVG W/O BG & Water	Range
METAL	mg/kg		mg/L	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
COPPER	5		<.01	<.34	4.77	5.75	5.75	4.89	3.62	D(<2.93)-15
LEAD	53		<.06	<4.07	<3.14	<1.49	53	53	2.90	4.7-647
CHROMIUM	3		<.02	1.76	1.31	2.27	3	2.02	1.78	D(<2.14)-15
MERCURY	<2.32		<.04	<2.71	<2.09	2.34	2.34	2.34	2.38	0.02-0.99
BARIUM	14		<.01	2.51	2.57	3.77	14	6.36	2.54	D(<5)-1720
NICKEL	3		<.05	<3.39	<2.62	1.95	3	3.00	2.65	D(<3.1)-13
POTASSIUM	191		<.85	<.56	66	69	191	128	67.5	270-5820
ZINC	21		<.01	6.65	5.63	7.83	21	11.09	6.70	23-798
CADMIUM	<.058		<.01	<.68	<.52	<.25	<.68	0.30	0.48	ND(<2.5)-8.2
ALUMINUM	1836		0.33	646	528	703	1836	752	625	1383-37,200
CALCIUM	63,755		0.63	25757	24992	33098	63775	28631	27949.00	813-130,000
TITANIUM	<2.9		<.05	43.4	34.8	61	61	39.10	46.40	—
NITRATE	Not Tested		0.168	0.576	0.61	1.02	1.02	0.45	0.74	—

(1) COMPOSITE OF 8 SAMPLES (2 RINGS AT 25 AND 50 FEET RADIUS) — REMAINDER FROZEN
(2) ICE TAKEN FROM SMALL FROZEN "POND" NEXT TO QUARRY WALL
(3) COMPOSITE OF 12 SAMPLES, ONE EACH FROM EDGE OF EACH DISPOSAL AREA —REMAINDER FROZEN
(4) COMPOSITE OF 6 LOCATIONS
(5) COMPOSITE OF 6 LOCATIONS
(6) ILLINOIS BACKGROUND RANGE FOR COUNTIES WITHIN METROPOLITAN STATISTICAL AREA